Specification Amendments

A. Please replace the paragraph beginning on page 10, line 1, with the following amended paragraph:

B1

A continuously varying resistor in fluid communication with the separation channel along at least a portion of the longitudinal axis intermediate the first and second ends comprises a resistor having a resistance that varies as a continuous function of position along the longitudinal axis of the separation channel, whereby ~~a~~ an electric potential in the electrolyte fluid varies as a non-linear continuous function of position along the longitudinal axis of the separation channel, and as a result the electric field intensity varies as a continuous function of position along the longitudinal axis over at least a portion of the separation channel intermediate the first and second ends. Such a resistor can comprise a contour resistor which contacts the fluid within the channel by forming a part of the channel wall, or the continuously varying resistor can comprise a filament within the separation channel, or the continuously varying resistor can comprise some other variable, such as a packing within the separation channel that varies in resistivity as a continuous function of position along the longitudinal axis. In further detail, a contour resistor can comprise a conductive material having a cross sectional shape which varies as a continuous function of position along the longitudinal axis. Alternatively, the contour resistor can be configured so that it has a material property that varies as a continuous function of position along said longitudinal axis.

B. Please replace the paragraph beginning on page 11, line 7, with the following amended paragraph:

B2

In another detailed aspect, the system can further comprise a first orientation electric

field generator. The first orientation electric field generator can ~~comprises~~ comprise an electroosmotic flow generator as set forth above, wherein the first plate and the second plate are brought to different potentials so as to create a transverse or alignment electric field configured to align bipolar molecules in directions normal to the first and second plates. The orientation electric field can be made to oscillate at a selected frequency. The system can further comprise a second orientation electric field generator configured for generating a second orientation electric field acting in a direction normal to the first orientation electric field, wherein the first and second orientation electric fields can be varied to orient bipolar molecules to a selected orientation by cooperation between the first and second orientation alignment electric fields.

B2 Cont'd

C. Please replace the paragraph beginning on page 17, line 19, with the following amended paragraph:

B3

The diagram indicates a channel 32 with contour resistors comprising a wedge-shaped resistive material arranged along each of two opposing sides. While this general configuration is currently preferred, with reference to FIG. 5, it will be appreciated that the functionality discussed can be achieved in other ways. For example in a channel 60 of circular cross section a filament 62 of non-conductive material can be disposed within, and comprise a section 64 comprising a shunt resistor in fluid contact with the interior of the channel and having a variable resistance which is a continuous function of position along the longitudinal axis of the channel. This can be done for example by variation of material 66 deposited on the filament, or varying the diameter of the filament in the shunt resistor segment to form a reduced diameter section 68 as well as varying the thickness of deposited material; or the continuously varying resistor can comprise some other variable, such as a packing within the separation channel 67 that varies in resistivity as a continuous function of

new matter?

B3 Cont'd.

<u>position along the longitudinal axis</u>. Other ways of varying the resistance within a segment of a channel of round, rectilinear, or other crossectional shape are possible.

D. Please replace the paragraph beginning on page 18, line 9, with the following amended paragraph:

B4

With reference to FIGs. 6, 7 and 8, the defining structure and operation of the first, or primary separation channel 32 will now be discussed. It will be understood that the structure will be disposed within and carried by a monolith (not shown) comprising upper 65 and lower 67 plates formed of glass or refractory material having good electrical isolation properties, and outside of these plates a non-conductive coolant fluid flowpath (not shown) is provided to allow a non-conductive coolant to flow past the plates and carry away heat generated by the apparatus to be described. Other connections, conduits, supporting structure, as required to bring in and convey out electrical power and signals indicative of analyte parameters, coolant, optical isolators for electrical power and signals as required, and other structure(s) as will be required, are assumed to be familiar and their necessity and possible configurations apparent to those skilled in the art. In addition to the first channel, the second channel and a connecting channel, a part of the steering valve that connects the primary channel to the secondary channel, are also included in the monolith. The monolith also must provide an interface to a fraction collector, and/or specific detector (e.g. time-of-flight mass spectrometer), from the secondary channel. This monolith structure comprises the foregoing housed in a monolithic laminated ceramic slab measuring in one embodiment about 23 cm x ~~6.6~~ <u>6.0</u> cm x ~~6.4~~ <u>0.64</u> cm.

E. Please replace the paragraph beginning on page 28, line 19, with the following amended paragraph:

With reference again to FIG. 8, two lateral field electrodes 102, 104 can be placed outboard of the channel 32 and ~~contour~~ electrodes 74, 76. These lateral field electrodes enable further fine control of separation of analytes. For example, they can be used to separate like molecules of differing length. As will be appreciated the longer a molecule is, the greater the difference in mobility in a longitudinal direction as compared with mobility in a transverse direction. Also, the longer it is, the more "stiffened" it is generally in the presence of the longitudinal electrical field compared to a normal state. Applying a lateral AC electric field will tend to rotate, or at least "wiggle" polar molecules, and the longer the molecule the more this effect will tend to influence its mobility in a direction parallel with the longitudinal axis of the channel 32 and the EOF induced flow of the electrolyte solution as the frontal area exposed to the flow will be greater.

B5

F. Please replace the paragraph beginning on page 30, line 6, with the following amended paragraph:

Based on these assumptions, we start with a channel 32 that is about 4000 μm wide, has a 50 μm height approximately, and is about 21 cm long. A set of distributed contour resistors ~~42~~ 46, each 15 cm in length and about 12 μm thick, are placed centrally in the channel. The resistors are in the plane of the channel and contact the channel in the 50 μm height dimension forming a portion of the wall (12 μm out of 50 μm), and cause a resistive shunt to be formed with the electrolyte in the main channel as set forth above. Each resistor is geometrically shaped or has varying resistivity with longitudinal length to cause a nonlinear voltage gradient within the channel. If the resistors are shaped, then at the anode side, the distributed resistors are thin, (a high resistance), while at the cathode side the resistors are wide, (a much lower resistance). The shape of the contour ~~of the~~ resistors causes the channel voltage gradient to vary in a predictable manner. A constant width resistor has a linear voltage drop per increment of channel distance, while contoured resistors cause the voltage drop per increment of channel to vary. The voltage gradient of the electrolyte in the channel can thus be contoured for any monotonic function. For our example, we will shape the

B6

electric field intensity to be linear over the length of the gradient starting with -300 V/cm at the anode side and decreasing to zero at the cathode side. We can then mathematically define this electric field intensity with the longitudinal dimension (x) as

B4 Cont'd

$E(x) = -300 \cancel{+} \underline{-}20x$ Where E(x) is the electric field intensity at x in V/cm

By integrating E(x), we can determine what voltage profile is required to generate the electric field intensity, which results in

$V(x) = 10x^2 - 300x + 2250$ Where V(x) is the voltage at point X

(Note: the constant was determined by forcing the voltage to zero at x = 15 cm)

V(x) generates an electric field intensity E(x) that has a high of -300 V/cm to 0 V/cm over the distance of x = 0 to x = 15 cm.

G. Please replace the paragraph beginning on page 33, line 3, with the following amended paragraph:

To calculate the incremental shunt resistance in parallel with the channel 32 to generate the voltage gradient $V(x) = 10x^2-300x +2250$ requires that $V(x_1 - x_2)$ = (current)(equivalent resistance) for each interval $x_1 - x_2$

B7

$R_{eq} = (R_C)(R_R)/(R_R + 2R_C)$

Where R_{eq} is the equivalent incremental resistance

R_C is the incremental channel resistance

R_R is the incremental contour resistance

Solving for R_R yields

$R_R = (2)(\Delta V)(\underline{R_C}\ \cancel{RC})/[(I)(\underline{R_C}\ \cancel{RC}) - (\underline{\Delta}V)]$

Where (ΔV is the incremental voltage drop (0.2 cm)

If the interval is 0.2 cm then the incremental resistance for the channel becomes 12 k ohms per 0.2 cm increment.
